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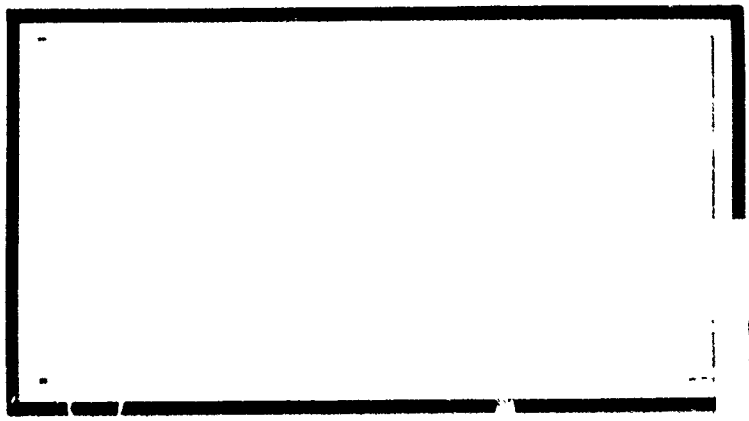

Fort Belvoir, Virginia 22060

PATNODE

PROBLEMS OF MANAGING COMPETITIVE PROTOTYPE PROGRAMS
STUDY REPORT
PMC 73-2

Clarence A. Patnode, Jr.
LTC USA

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* PROBLEMS OF MANAGING COMPETITIVE PROTOTYPE PROGRAMS		5. TYPE OF REPORT & PERIOD COVERED Student Project Report 73-2 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) CLARENCE A. PATNODE, JR.		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS DEFENSE SYSTEMS MANAGEMENT COLLEGE FT. BELVOIR, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEFENSE SYSTEMS MANAGEMENT COLLEGE FT. BELVOIR, VA 22060		12. REPORT DATE 1973-2 13. NUMBER OF PAGES 34
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

UNLIMITED

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

SEE ATTACHED SHEET

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

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DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

DEFENSE SYSTEMS MANAGEMENT SCHOOL

STUDY TITLE: PROBLEMS OF MANAGING COMPETITIVE PROTOTYPE PROGRAMS

STUDY PROBLEM/QUESTION: To examine the problems to date of managing competitive prototype programs within the Department of Defense.

STUDY REPORT ABSTRACT:

The problems of managing competitive prototypes are not well documented. This report is an examination of the related literature and the information obtained from interviews of key personnel involved in prototype programs. Currently, all the military services are engaged in prototype efforts. There are a variety of problems in managing the programs. They do not appear to detract from the goals of improved acquisition.

KEY WORDS: MATERIEL DESIGN AND DEVELOPMENT AIRCRAFT PROTOTYPES SOURCE SELECTION ENGINEERING CHANGES

Student, Rank Service
Clarence A. Patnode, Jr.
LTC, USA

Class
73-2

Date
November 1973

PROBLEMS IN MANAGING COMPETITIVE PROTOTYPE PROGRAMS

An Executive Summary
of a
Study Report
by

Clarence A. Patnode, Jr.
LTC USA

November 1973

Defense Systems Management School
Program Management Course
Class 73-2
Fort Belvoir, Virginia 22060

EXECUTIVE SUMMARY

The purpose of this study is to examine current problems of managing competitive prototype programs. An illumination of these difficulties may be helpful to defense system managers. The examination of the predicament of driving both competitors to a single design and the cross flow of design between contractors was used as a lead question for the examination of the overall area of interest.

Mr. David Packard, former Deputy Secretary of Defense, formulated his policy for the improvement of defense systems acquisition which was documented in DOD Directive 5000.1 published in July 1971. An important element of this directive was the development of a strong and useable technology base. This base was to be maintained by conducting research and advanced technology efforts, including prototyping.

The U. S. Air Force conducted a study in the spring of 1971 to review the rationale for prototyping and to structure a sound plan for prototype development. It identified attractive candidates for prototyping as a demonstration of the concept of obtaining significant technological advances at minimum cost. Two of these candidates, the Advanced Medium Short Takeoff and Landing Transport and the

Lightweight Fighter Program, are currently in competitive prototype development. In that these two programs followed, in a classical sense, the guidance for prototyping, they were used as the primary source of information concerning current problem areas.

Some of the areas investigated were: (1) driving both competitors to a single design, (2) the cross flow of design between competitors, (3) reduced data, (4) excessive visits to contractors' facilities, and (5) limited flight or system test hours.

The Source Selection Authority has a key role to play in the first two problem areas mentioned above. During the evaluation of proposals, fundamentally different design approaches can be selected for their contribution to the overall objectives of the program. The program director is able to initiate the program with more than one basic design.

The examined problem areas, while of concern to the program directors, did not reveal any unsurmountable obstacles. All of the areas did involve some lack of recognition by the defense management community of the real differences in the approach of small program offices, reduced funds and data, and the lack of compliance to many production oriented directives.

The enthusiasm of the participants and the excellent results thus

far warrant careful consideration of prototyping as a means of improving defense system acquisition.

PROBLEMS IN MANAGING COMPETITIVE PROTOTYPE PROGRAMS

STUDY REPORT

Presented to the Faculty

of the

Defense Systems Management School

in Partial Fulfillment of the

Program Management Course

Class 73-2

by

Clarence A. Patnode, Jr.
LTC USA

November 1973

ACKNOWLEDGEMENTS

With a deep sense of appreciation, I wish to thank the following persons for their expert assistance and patience in research interviews:

Brigadier General Leo D. Turner, Project Manager, Utility Tactical Transport Aircraft System, United States Army Materiel Command, St. Louis, Missouri

Colonel Robert L. McDaniel, Military Assistant, Office of the Assistant Director for Combat Support, DDR&E

Lieutenant Colonel James M. Reed, Jr., System Program Director, Advanced Medium Short Takeoff and Landing Transport, Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson AFB

Mr. Douglas E. Ringwall, Chief, Program Control, Lightweight Fighter Program, Aeronautical System Division, Air Force Systems Command, Wright-Patterson AFB

Also, I gratefully acknowledge CDR Edwin H. Grant, Jr., my Study Advisor, for his expert professional guidance and counsel during the preparation of this report. I extend my thanks to Mrs. Roger G. Klungle for kindly typing the manuscript.

Contents

PROBLEMS OF MANAGING COMPETITIVE PROTOTYPE PROGRAMS*

Introduction

The problems of managing competitive prototype programs are not well documented. This is due in a large part to the nature of reduced documentation and small management and design teams where the resolution of problems is accomplished within "closed" surroundings. Prototyping has been used extensively throughout DOD in the past. Recent emphasis by Mr. David Packard. former Deputy Secretary of Defense, stressed the need for improvement in the management of defense system acquisitions. He suggested prototyping as a means for reducing uncertainty.

Currently, all the military services are engaged in prototype programs. Although there are a variety of problems, they do not appear to detract from the goals of improved acquisition.

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*ABSTAINER

This study represents the views, conclusions and recommendations of the author and does not necessarily reflect the official opinion of the Defense Systems Management School nor the Department of Defense.

CHAPTER I

Purpose of Study

The purpose of this study is to examine some of the management problems associated with competitive prototype programs. Although some prototype efforts are not "competitive" by title, the strong possibility of an eventual production contract tends to make all prototype developments, involving more than one contractor, competitive in nature. A complete assessment of the results of the prototype approach will have to wait for the completion of a number of the programs. This study is focused on the problems of two prototype developments as they exist during the fall of 1973.

Soon after taking office, Mr. Packard expressed dissatisfaction with the total package procurement. He initiated efforts at numerous levels within DOD to improve the overall defense systems acquisition process. He contended that successful system development required a strong and useable technology base, developed through research and advanced technology efforts (1). He believed the DOD should put more reliance on hardware and less on paper studies in Advanced Development (2). Since hardware in Advanced Development lends itself to prototyping, there has been a revival of strong interest in the approach.

This approach is not an altogether new concept to the U. S. military departments. One of the earliest examples took place shortly after the War of 1812 when the Army became interested in a breech-loading rifle. As a result of an RFP --- or maybe an RFQ --- a number of contractors submitted actual hardware examples for evaluation. John Hall's design was accepted. He was given an order for a limited production and these rifles were issued to the only rifle regiment in the Army in 1820. A test and evaluation was conducted in Nebraska and the rifles were found to be unsatisfactory and were never adopted (3).

During the first half of this century, the U. S. aircraft industry used prototypes extensively. The military services have descended from some great prototyperes -- Chanute, the Wrights, Curtiss, Sikorsky, Martin and more recently General Dynamics, Boeing, Douglas and McDonnell (4).

In 1962 the Army had an example of prototyping, the Light Observation Helicopter (LOH). In the LOH program, the Army went out with a mission type description only, limited the contractors' responses to 35 pages, selected two winners, and instructed them to deliver FAA certified flying prototypes. If they met the requirements, the companies were to be paid. A third company joined in, saying to the Army, "Your evaluation team said it was impossible to do what

we proposed, but how can you lose if we don't produce, we don't get paid." The results of this effort provided three good sets of prototypes (3).

In the spring of 1971, the U. S. Air Force initiated a study to assess the prototype concept. It was directed by Brigadier General Kenneth R. Chapman, Deputy Chief of Staff Development Plans, Headquarters Air Force System Command. This effort reviewed the rationale for prototyping and structured a sound plan for prototype development. Part of the study group activity was devoted to identifying attractive USAF candidates for prototype development as a demonstration of the concept of obtaining significant advances in technology at minimum cost. The resulting plan recommended streamlined management and procurement approaches (5).

During the same general time-frame, the U. S. Army, recalling its success in the LOH, initiated an experimental prototype program and a development prototype program. The Heavy Lift Helicopter (HLH) program was initiated on an advanced technology component development effort. Later it was converted to an experimental test bed aircraft to demonstrate that the technology developed in the component effort was in hand and that the HLH satisfied the mission requirements prior to making the Engineering Development Decision.

The Utility Tactical Transport Aircraft System (UTTAS) was established as a development prototype program which is similar in many ways to the earlier LOH program. As the formulated replacement for the UH-1 helicopter, the UTTAS will be the backbone of the Army's tactical air mobility.

The U. S. Air Force initiated two advanced prototype aircraft projects in Fiscal Year 1972. The first was the Lightweight Fighter (LWF), intended to demonstrate advanced fighter technology specifically designed into a small, very high performance aircraft, weighing less than 20,000 pounds. The second was the Advanced Medium Short Takeoff and Landing Transport (AMST) intended to provide data on the cost and design features associated with short field performance in an aircraft of the C-130 size class. A fully developed AMST could be a possible replacement for the aging C-130 airlift force (6).

The U. S. Navy is actively engaged in a number of prototype programs in both ships and aircraft. Due to the limited scope of this study, no Navy systems are incorporated in this effort.

Although the technological aspects of these programs are very important, there are specific goals for improved program management and procurement. Major General George Sammet, Jr., then Deputy Chief of Staff for Research and Development, Department

of the Army, addressed two of these goals during his presentation to the Seminar on Prototyping of the National Security Industrial Association, 23 - 24 February 1972:

> It is also my impression that Mr. Packard's real goal was not prototyping per se. He was as much interested in the accompanying management techniques --- streamlined as they were --- as he was in any piece of hardware which may result from prototyping. Perhaps even more so! I think he was using prototyping as a foil to cut through bureaucracy. (3)

The goals other than technological will be addressed more fully due to their pronounced reoccurrence during interviews.

Research Questions

In order to organize the research for the study and to provide a common introduction to each interview, two basic research questions were selected to limit my research. The questions are related to the management aspects of prototype programs where more than one contractor is participating in the development. The two research questions are:

(1) How do you prevent driving the competitors to a single design when they get compared in detail with the same requirement?

(2) How do you control the real desire of a contractor to quickly incorporate a change that will match a characteristic in his competitor's design that he feels gives his competitor an advantage?

Data Collection and Analysis Procedure

As mentioned earlier, there are very few recent writings on the subject of prototype management problems, a moderate number of writings on the initiation of the prototype concept do exist. The personal interview approach was selected to obtain current information pertaining to currently on-going programs. The following personnel were interviewed: Colonel Robert McDaniel, for an overall view of the subject from a DDR&E viewpoint on 6 August 1973; Brigadier General Leo C. Turner, Project Manager UTTAS, for a program with a large planned production run on 9 August 1973; LTC James M. Reed, Jr., Program Director, AMST, and Mr. Douglas Ringwall, Chief Program Control, Light Weight Fighter, for the viewpoint of the two USAF programs that resulted from the very excellent study effort conducted by the USAF on 19 October 1973.

It became evident from the first interview that the two questions chosen were not necessarily the areas of greatest concern to the men who are directly involved in prototype programs.

While personal interviews were the primary mode of acquiring current data, a detailed literature search was conducted to include some history and to establish the overall position within the DOD concerning prototyping.

Scope and Limitation

The scope of the study is limited to detailed consideration of two USAF programs for the interviews. Numerous attempts were made to interview the Surface Effects Ship project office personnel, but the nearness of Source Selection made this impossible. The intent was to cover a program soon after its initiation, and this was done with the AMST. The other program was to be one well along in the evaluation of its prototypes. The Surface Effects Ship program was the planned program for this area. The Light Weight Fighter with first flight just a few months away made a good substitute for this area.

The study looks at a number of problem areas other than the two on which the effort was centered. These problems are:

- What are the problems in selecting people for the prototype program offices?
- What are the problems of page limited RFPs and responses?
- What are the problems of reduced reporting and the scarcity of data in the program office?
- What are the problems with higher headquarters that still expect the same amount of briefings, visits to the contractor's facilities and responses to numerous "what

ifs" that do not really pertain to the prototype system?

- What are the problems in accommodating all the Developmental tests and Operation tests that higher headquarters want accomplished even though a very few systems are fabricated?

These areas were covered in varying depths depending on the amount of concern voiced by the persons interviewed. As mentioned earlier, the first two problem areas were methodically addressed and then the interviewees responded to what they felt were problem areas in their programs.

Organization of the Study

The study is presented in five chapters with a supporting bibliography.

Chapter I explains the purpose of the study and provides the necessary background material to set the stage for the particular areas covered by the study. Unfamiliar terms are defined. The reader is assumed to have a working knowledge of the terminology of defense system acquisition.

Chapter II reviews research which is related to the study subject. There are a number of public statements by various DOD officials concerning prototyping and the rationale supporting this

method of development. However, there is very little published by those who are managing their programs.

Chapter III addresses the first interview question. There are a number of techniques available to prevent driving competitors to a single design.

Chapter IV concerns the second interview question. The cross flow of design is not as detrimental as first envisioned. Proper external controls bound the problem quite well.

Chapter V contains the most common problem areas surfaced during the interviews. The responsible manager saw them as areas of concern and awareness rather than insurmountable obstacles.

Chapter VI is a summary of the study and the author's conclusions.

CHAPTER II

Review of Related Research

The numerous speeches, congressional testimonies, and papers presented to professional societies center on two practices within the defense system acquisition process that have led to excessive costs and unsatisfactory results. One is the excessive reliance on paper studies and paper analysis. The problems of this reliance have been evident in all stages of past programs, conceptual, validation, scale development and production. The other problem is the concurrency between development and production (6).

The prototype approach should help to minimize these two problems. The underlying objective of prototyping is to place more reliance on the performance of hardware and less reliance on paper analysis. The ability to evaluate both the feasibility and utility of a new system before production and in some cases before full-scale development is very desirable from a defense point of view (6).

Directives and paper analyses do not manage programs; people do. In that there is very little written on the "how" of managing prototype efforts, it is critically important to select the right kind of people to manage these developments, both within DOD and within the contractor organization. Ideally, these people should be experienced in the thinking involved in how to best meet the objective

rather than dogged compliance to directives. In that decisions based on judgment rather than detailed analyses will be needed many times, experience on which to base intuitive judgments is most important. Effective communications, a winning spirit and trust must permeate the entire management complex, government and contractor (4).

In that there were a number of successful prototype programs prior to the paper study and analysis era of the 1960's, there are good reasons to expect some very good results from current efforts in this field.

CHAPTER III

How to Prevent Driving Competitors to a Single Design

The Source Selection Authority (SSA) can play a significant role in this area. During the evaluation of the contractor's proposals, fundamentally different design approaches should be evaluated on their contribution to the overall objectives of the program. When sufficient proposals are received, the SSA can avoid duplicating similar designs by picking a winner from each similar design group. An example would be picking both a single engine and a twin engine design for a fighter aircraft. When criteria such as this is used, the contractors must be told so that the fundamental differences do not get redesigned out of the program (7:8).

Since prototype programs should be evaluated against criteria in consonance with program objectives, performance goals rather than detailed specifications should be the key. Envoking specifications can very often drive the design closer. A word of caution at this point: the specification business is dramatically different in an experimental or developmental prototype program versus a production program. The number of applicable directives can be reduced by an order of magnitude when there is no requirement to be prepared for production. This aside, the program manager can often do well to stay out of

evaluating changes and let the design team do what makes sense to them. When a design change can be made within fiscal constraints, the tradeoff should be in the hands of the design team (7:8).

After the prototypes are fabricated, the defense management team must guard against adding features to one competitor's design that they have found to their liking while evaluating the other design. The tendency for the cultist to pressure this change is very real. An example of this is finding a running time recorder on an auxiliary power unit and then requiring the other contractor to do the same by government direction (5:9).

CHAPTER IV

How to Dampen the Cross Flow of Design Between Competitors

The reduced data requirements in prototype programs provide a healthy underlying condition to stymie the cross flow. First, by reducing the technical data that is reported, knowledge of the competitor's detailed design is reduced throughout the management community. In both the AMST and LWF programs the periodic reporting is mostly financial. This is particularly true in the case of monthly reports. Secondly, the distribution of all reports to higher headquarters is dramatically reduced in these programs. Without knowledge of what is happening in design, the functional areas and cultists are at a disadvantage in being able to discuss things in detail and thereby provide the many sources where contractor intelligence can find out the details of the competition's design. The LWF program was on contract for eight months before their higher headquarters asked for any significant details (8).

Cross flow is greatly inhibited if the program manager makes a concentrated effort to suppress his own people from picking favorites among the competitors. This suggests that having two teams in the program office, one to monitor each contractor, would present some potential hazards. As in the case of the first question, many of the

same cautions apply here. Government personnel who talk to the contractor must be exceedingly careful with their comments. Where cross flow is to the benefit of the government, it should not be eliminated but it should not originate within the government team. This has not become a problem in the eyes of the AMST and LWF program managers (7:8).

CHAPTER V

Other Problem Areas as Seen by Prototype Managers

Indicative of the difficulty in learning about the problems of managing competitive prototypes is the limited response to the two questions generated by the literature research. This chapter addresses the problem areas as seen by the manager currently running prototype programs.

Explaining What You Are Doing

Because prototype programs with drastically reduced data requirements have not been common place for 10 - 15 years, numerous requests are put on the prototype officer for data that just doesn't exist. Also, the small contractor design team cannot afford to be diverted to generating the data without having serious impacts on the program. Whenever a service develops a new policy to be applied to all systems, the prototype program manager often must try to explain why he cannot comply. Again, most of the directives, the majority of which apply to production or eventual production, which emanate from the functional areas are not, and appropriately so, applicable to prototype programs. Putting this widget and that widget into the system is not in keeping with good prototype contracts (7:8).

Keeping Visitors Out of the Contractor's Facilities

"I am going to be in the area on this other program, it would be a good time to take a look at that prototype program." This accounts for most of the communication from higher headquarters. The financial arrangements, small design team, and somewhat of a hands-off policy do not support the normal amount of government visitors. This is a real problem to both the AMST and LWF programs. Many firm and polite no's seem to be the only workable approach (7:8).

Problem in Transitioning to Production

A combination of not invoking the numerous production specifications on the contractors and very small program offices would prevent a rapid transition to production. Although the interviewees are not currently faced with this problem, the program directors consider it one of great potential for causing all kinds of problems for a program. Decision makers up the line must be kept aware of this potential hazard (7:8).

Limited Flight Test Hours

The contractor, the developer and the user have many objectives they wish to satisfy during testing. With two or three prototypes, it is clearly impossible to accommodate these three communities in succession or with partial overlap. The AMST program is planning

a joint contractor, flight test center, user flight test program. There will be integrated test flight crews throughout the program. Still, this area will require a great deal of planning and some significant concessions on the part of each of these three agencies (7).

The Schedule is Not Sacred

This is another area that requires education of the higher headquarters. The costs are sacred, the schedule is not. Both programs recognize that explaining why two contractors are at significantly different points in their programs is very difficult. Nonetheless, they also feel that it is the lesser of two evils and that the schedule must have some flexibility, and that the costs should not (7:8).

Government Furnished Equipment

Although Government Furnished Equipment (GFE) is not a problem at all peculiar to prototypes, it is at least as bad here as elsewhere. The AMST program manager has run into the problem of timely GFE delivery in the first year of his program (7).

Quantitative Versus Subjective Evaluations

The use of a quantitative evaluation where the proposals are being compared to performance goals rather than detailed specifications presents a problem. It is difficult to relate highly structured numerical ratings to broad statements of performance goals. The

LWF program manager was very pleased with the use of a subjective evaluation in line with the philosophy contained in the USAF Prototype Study (7:8).

A Good Problem Avoidance

A major problem avoidance experienced by both the AMST and LWF programs is included here. It was heartily endorsed by each program manager. By establishing the program budgets over each year of the program and telling the contractor what he would get each year, much better planning was accomplished. Additionally, the contractors were told that their budget was set. There would be no attempts to negotiate the contractor down to a lower cost than that which had been announced (7:8).

This chapter has treated these problems briefly. There is not a completed program where their weight could be evaluated on the overall program. It appears that these two program managers are following the recommendations of the Final Report: USAF Prototype Study. One comment from the study comes to mind time and again when talking to these people:

> "Personal attention as to what is going on must be the accepted substitute for formal data and reports."

The AMST and LWF teams are characterized by the above quote.

CHAPTER VI

Summary and Conclusions

The purpose of this study was to examine the problems of managing competitive prototype programs. The illumination of some of these problems and how current managers see them in relation to their programs will hopefully be helpful to defense system managers engaged in prototyping. Chapters III, IV and V report on the more significant problems uncovered by this effort. Although these problems warrant consideration by managers, none of the personnel interviewed, nor in fact the literature on the subject, revealed any insurmountable obstacles.

The problems of driving both competitors to a single design and the cross flow of design between competitors did not rank highly in difficulty with those interviewed. It is believed this was due in part to their early recognition of the potential for problems in these areas and the positive steps taken to avoid them.

The problems of explaining what you are doing and keeping visitors out of the contractor's facilities should diminish as DOD gains more experience with prototype programs. The number of key personnel changes at the top levels of OSD may well be mitigating against high level help in these areas. These two problem areas will persist as shortcomings of a large bureaucratic organization that is

unlikely to experience any real big change in the near future. Support of the program managers in their decisions in these areas would provide the assistance and stability required to keep these problems manageable.

Limited flight or system test hours to satisfy a wide variety of requirements will continue to pose major problems to the program manager. There are too many agencies that can present requirements in this area, yet none of them can ultimately provide the time or the funds that would be required to provide an ideal amount of test hours. While the United States Congress supports many of these test objectives, they also have the final authority on funds. The past performance of the Senate Armed Services Committee has been to not increase either the time allowed or the funds to buy more prototype systems. Joint test teams working on integrated test plans will provide some relief. It will remain the program manager's problem to establish the balance between desired test requirements and resources to accomplish these test requirements.

The remaining problem areas do not present the magnitude of difficulties discussed above. They should be overcome by early recognition and positive steps to minimize their impact.

The business of establishing the budgets and holding them constant is particularly important in that it supports much better planning. With the better planning, the design teams focus on the

basic problems internal to the program and minimize the external "what if" drills that are too costly in time and money for programs on modest budgets with small design and management teams.

For efficiency, prototype programs must be managed with a minimum of constraints. They should be designed to meet performance goals, not detailed specifications.

Competitive prototyping is good. Competition is the real motivation for excellence; the contractor's competition is a more efficient "watch dog" than any government program office and layers of high headquarters. The DOD should realize most of the goals for prototyping held by the OSD.

Recommended Areas for Future Study

Since both the AMST and LWF programs are still in the design phase, final assessments are not practical. At the completion of these two programs, the following area should be examined:

What were the major management problems throughout the life of the program?

Prior to the completion of these two programs the following area should be examined:

What should be the major considerations in transitioning from an advanced technology prototype program to the award of a production contract?

ANNOTATED BIBLIOGRAPHY

1. U. S. Department of Defense Directive Number 5000.1, Acquisition of Major Defense Systems, 13 July 1971.

2. Packard, David, "Address to National Security Industrial Association," Proceedings of Symposium on Major Defense Systems Acquisition, 11-12 August 1971.
   Introduces the changes in defense systems acquisition he instituted based on his first two and one half years as Deputy Secretary of Defense.

3. Sammet, George, Jr., Major General, "Address to National Security Industrial Association," Seminar on Prototyping, 23-24 February 1972.

4. McDonnell, Sanford N., "Address to National Security Industrial Association," Seminar on Prototyping, 23-24 February 1972.
   Brief description of selecting people for prototype programs. Discusses the personal characteristics of both leaders and team members.

5. U. S. Department of Air Force, Final Report: USAF Prototype Study, August, 1971 (Confidential).
   Reports on results of Air Force Prototype Study. Documents rationale for and recommendation of streamlined management and procurement approaches.

6. U. S. Congress, Senate Committee on Armed Services, Ninety-second Congress, 9 September 1971, Advanced Prototype. Washington: Government Printing Office, 1971.
   Public record of Secretary Packard's explanation to Congress on the benefit[illegible]ould accrue from advanced prototype program.

7. Interview with Lieutenant Colonel James M. Reed, Jr., System Program Director, Advanced Medium Short Takeoff and Landing Transport, Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson AFB, Ohio, 19 October 1973.

8. Interview with Douglas E. Ringwall, Chief, Program Control, Lightweight Fighter Program, Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson AFB, Ohio, 19 October 1973.

9. Interview with Colonel Robert L. McDaniel, Military Assistant, Office of the Assistant Director for Combat Support, DDR&E, Pentagon, 6 August 1973.

10. Foster, John S., Jr., "How Our New R&D Policy Relies on the Extensive Use of Prototypes," Air Force Magazine, August, 1971, p. 32.
Introduces the revival of the prototyping approach in defense system acquisition. Defines different prototype categories.

11. Davies, Thomas D., RADM, USN, "Address to National Security Industrial Association," Seminar on Prototyping, 23-24 February 1972.

12. Interview with Brigadier General Leo D. Turner, Project Manager, Utility Tactical Transport Aircraft System, United States Army Materiel Command, St. Louis, Missouri, 9 August 1973.

13. U. S. Congress, Senate Committee on Armed Services, Statement by the Director of Defense Research and Engineering, Dr. John S. Foster, Jr. on Aspects of Defense Systems Acquisition. Washington: Government Printing Office, 1971.
Brief description of DOD Directive 5000.1 and how it implements some of the recommendations of the President's Blue Ribbon Defense Panel.

14. Weymouth, Ralph, Vice Admiral, USN, "Prototyping for the Navy Must Contribute to Reliable and Effective Systems," Defense Management Journal, July, 1972, pp. 11-13.

APPENDIX

Definition of Terms

Advanced Prototype - A prototype developed in an Advanced Development Program, using advanced development funds. In the following descriptions of prototypes by Dr. John S. Foster, advanced prototypes fall into the first two categories, but not the third.

(1) Experimental prototypes can be used to explore promising theories or laboratory findings, or to bridge the gap between theory and application in cases where the technology is "too green" for direct application or meaningful cost estimates. Examples include high energy laser systems and the so-called supercritical wing that extends the limits of the subsonic flight regime.

(2) Developmental prototypes can be used where the government lacks either the confidence or the urgency to enter a system into full-scale development. The purpose may be to gain information concerning cost or schedule tradeoffs, to reduce development lead times without actually developing, or to reduce technological or manufacturing uncertainties. Examples include the B-1 bomber program, and the AWACS radar, and F-15 avionics.

(3) Production prototypes can be used when high-rate, volume production is planned to prove the system, tools, and production methods. This has been the most common form of prototyping and, among the three categories, the one that resembles most the eventual production system in terms of dimension, performance, and features (10).

AMST - Acronym for Advanced Medium Short Takeoff and Landing Transport

HLH - Acronym for Heavy Lift Helicopter

LOH - Acronym for Light Observation Helicopter

LWF - Acronym for Lightweight Fighter

SES - Acronym for Surface Effects Ship

UTTAS - Acronym for Utility Tactical Transport Aircraft System

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